WHAT IS CLAIMED IS:

1. A real-time biofilm monitoring system comprising:

a single fiber-optic probe that detects wavelength-specific fluorescence from biomarkers of fouling organisms;

a compact optoelectronic interface and data acquisition system interfaced with said probe, wherein said probe is bifurcated and contains at least one excitation and at least one emission filter permitting the simultaneous resolution of multiple biomarkers.

2. A real-time biofilm monitoring system comprising:

multiple fiber-optic probes detecting wavelength-specific fluorescence from biomarkers of fouling organisms;

a compact optoelectronic interface and data acquisition system interfaced with said probes, wherein said probes are bifurcated and contain at least one excitation and at least one emission filter permitting the simultaneous resolution of multiple biomarkers.

3. A real-time biofilm monitoring system comprising:

a. single or multiple fiber-optic probes detecting wavelength-specific fluorescence from biomarkers of fouling organisms;

b. a compact optoelectronic interface and data acquisition system interfaced with said probes, wherein said probe or probes are bifurcated and contain at least one excitation and at least one emission filter permitting the simultaneous resolution of multiple biomarkers.

4. A method for detecting fouling organisms comprising:

a. introducing excitation light into a first side of a bifurcated optical fiber directed at a sample;

b. obtaining emission arising from the substrate through a second side of a bifurcated optical fiber; and

c. detecting the emission arising from the substrate and correlating this emission to the presence or absence of fouling organisms.

5. The real time biofilm monitoring system according to claim 1 further including an excitation reference channel to correct for spectral interference from non-biological materials.

6. The real time biofilm monitoring system according to claim 2 further including an excitation reference channel to correct for spectral interference from non-biological materials.

7. The real time biofilm monitoring system according to claim 3 further including an excitation reference

channel to correct for spectral interference from non-biological materials.

8. The method according to claim 4 wherein the fouling organism is *P. Aeruginosa*.

9. The method according to claim 4 wherein the sample is selected from the group consisting of process fluids, heat exchange systems, utility plants, microelectronics fabrication systems, food processing systems, and pulp and paper processing systems.

10. The method according to claim 4 wherein the sample is a substrate selected from the group consisting of glass, polycarbonate, metal, and paint.

11. A method for detecting a plurality of fouling organisms comprising:

a. introducing excitation light into a plurality of first sides of a plurality of bifurcated optical fibers directed at a sample, wherein the excitation light can be the same or different for each first side of the bifurcated optical fiber bundles;

b. obtaining emissions arising from the substrate through second sides of a plurality of bifurcated optical fibers; and

c. detecting the emission arising from the substrate and correlating this emission to the presence or absence of fouling organisms.

12. The method according to claim 8 wherein the sample is selected from the group consisting of process fluids, heat exchange systems, utility plants, microelectronics fabrication systems, food processing systems, and pulp and paper processing systems.

13. The method according to claim 8 wherein the sample is a substrate selected from the group consisting of glass, polycarbonate, metal, and paint.